THE **DECARBONISATION** OF ROAD FREIGHT TRANSPORT

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Municipal and Electric Vehicle Sales Manager
DAF Trucks Ltd

DAF ROUTE TO **DECARBONISATION**

15% EU & UK carbon saving by 2025….

Pursue all available options:

- New legislation Masses & Dimensions

  = Aerodynamics
- More efficient drivelines
- Tyres with lower rolling resistance
- Further development of driver support systems: such as PCC and EcoRoll
- Offer BEV and PHEV ‘zero emissions’ solutions

30% saving by 2030, fossil-free by 2040, net zero by 2050

ALTERNATIVE FUELS

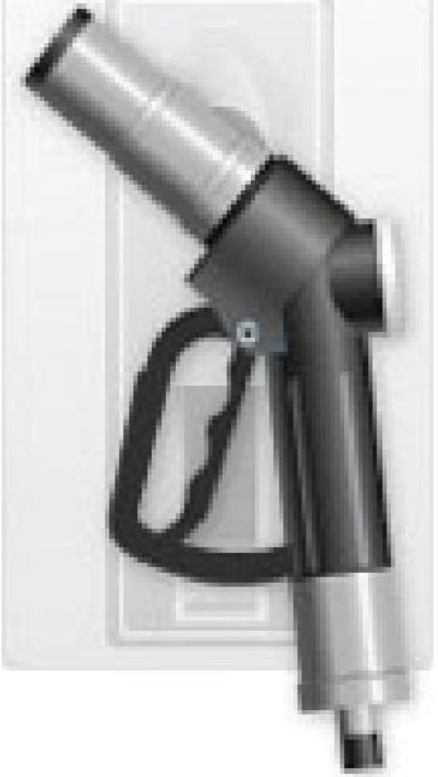
Biodiesel

HVO

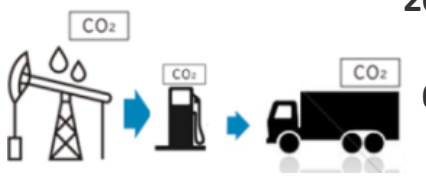
Natural Gas

Electricity

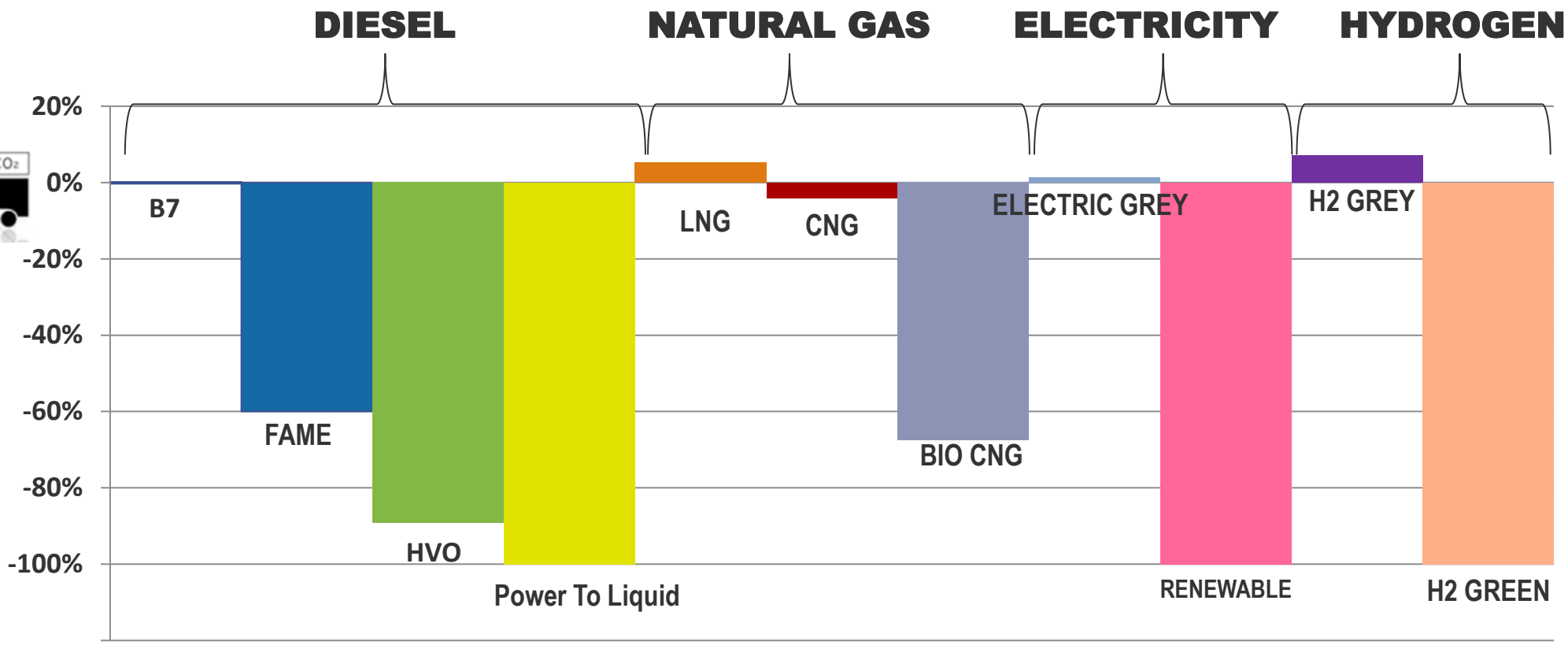
Hydrogen



GLOBAL WARMING ALTERNATIVE FUELS



WELL TO WHEEL



Source: CO2emissiefactoren.nl

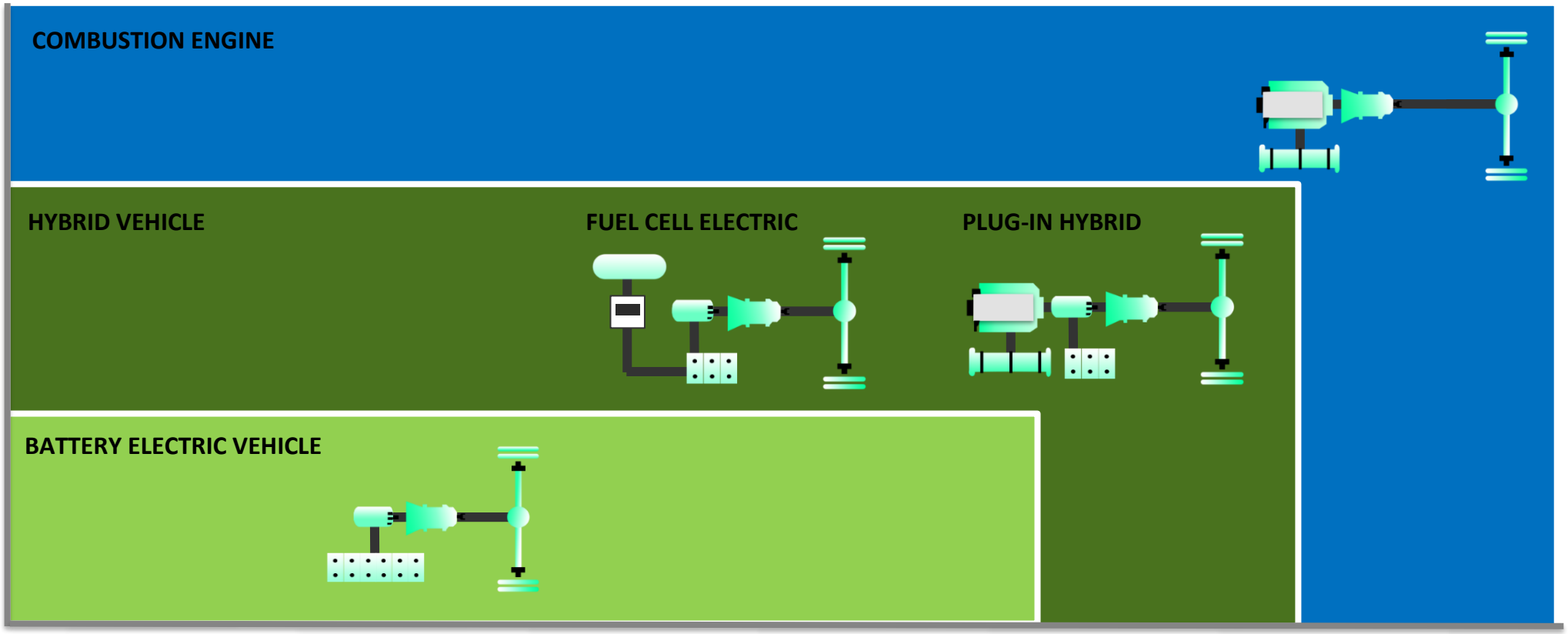
CO_2 EMISSION ALTERNATIVE FUELS

ZERO EMISSION SOLUTIONS

FOR A **VARIETY** OF APPLICATIONS

ZERO EMISSION SOLUTIONS

FOR A **VARIETY** OF APPLICATIONS




LF
ELECTRIC
DRIVING ZERO EMISSIONS
DAF
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DAF
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DAF ELECTRIC MODELS AVAILABLE TODAY

LF Electric 19t 4x2 Rigid

- Motor 260 kW / peak 370 kW
- Battery 240 kWh (effective)
- Fast Charge up to 150 kW
- Range 240 km

CF Electric 27t 6x2 Rigid

- Motor 210 kW / peak 240 kW
- Battery 315 kWh (effective)
- Fast Charge up to 250 kW
- Range 200-220 km

CF Electric 37t 4x2 Tractor

- Motor 210 kW / peak 240 kW
- Battery 315 kWh (effective)
- Fast Charge up to 250 kW
- Range 200-220 km

ELECTRIC VEHICLE CHALLENGES

Battery **E**lectric **V**ehicle (BEV)

- Batteries are heavy and low density which limits payload and range
- Production & recycling of lithium-ion batteries complex
- Electricity primarily generated using fossil fuels
- Motivation is local air quality
- Only option for entering ‘zero emission’ zones
- Electric charging network needs to develop
- Total Cost of Ownership

INNOVATION TRUCKS: **HYBRID**

Plug-in **H**ybrid **E**lectric **V**ehicle (PHEV)

- In the city:
  - Electric drive = ‘zero emissions’
  - Acceptance by city councils still unclear
- Outside the city:
  - Diesel = maximum range and flexibility
  - Electric motor = recuperation of braking energy
  - Greater fuel efficiency, less CO_2
- Plug-in technology provides additional fuel savings and CO_2 reduction
- First customer field trials trucks CF Hybrid in operation

DKTI-TRANSPORT CUSTOMER TRIALS

DEMONSTRATIEREGELING KLIMAAT TECHNOLOGIEËN EN INNOVATIES IN TRANSPORT

FIRST EXPERIENCES

- 2 DAF CF Hybrids
- 40-80 electric km's /day
- zero emission 20% of all kilometers

CF HYBRID – CITY DELIVERY

PACCAR MX-11
330 kW / 450 hp

75 kW
peak 130 kW

70 kWh
gross 85 kWh

E-range
30-50 km

During driving and plug-in
DC 150 kW

ELECTRIC ROAD SYSTEMS (ERS)

Main types

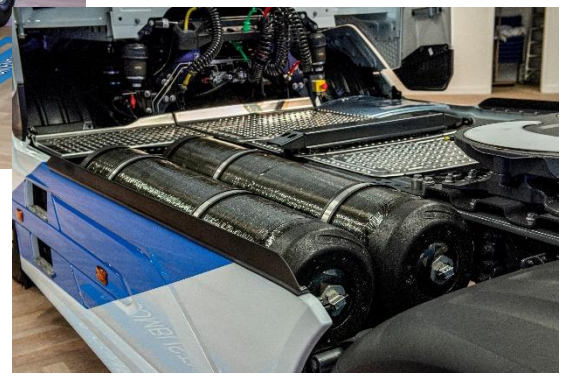
- Catenary pantograph– overhead
- Carrera – ground level
- Inductive coils

Long distance solution

Small batteries or hybrid driveline

High infrastructure investment

HYDROGEN DEVELOPMENTS

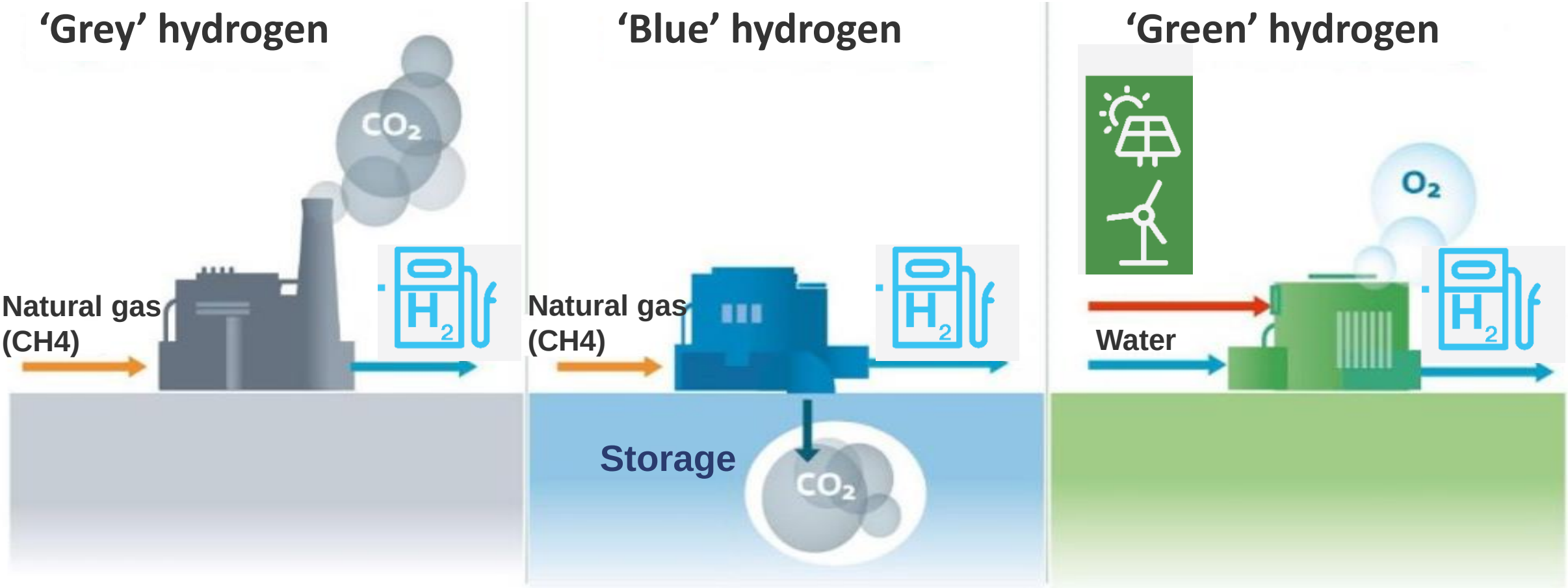


DAF hydrogen combustion engine prototype

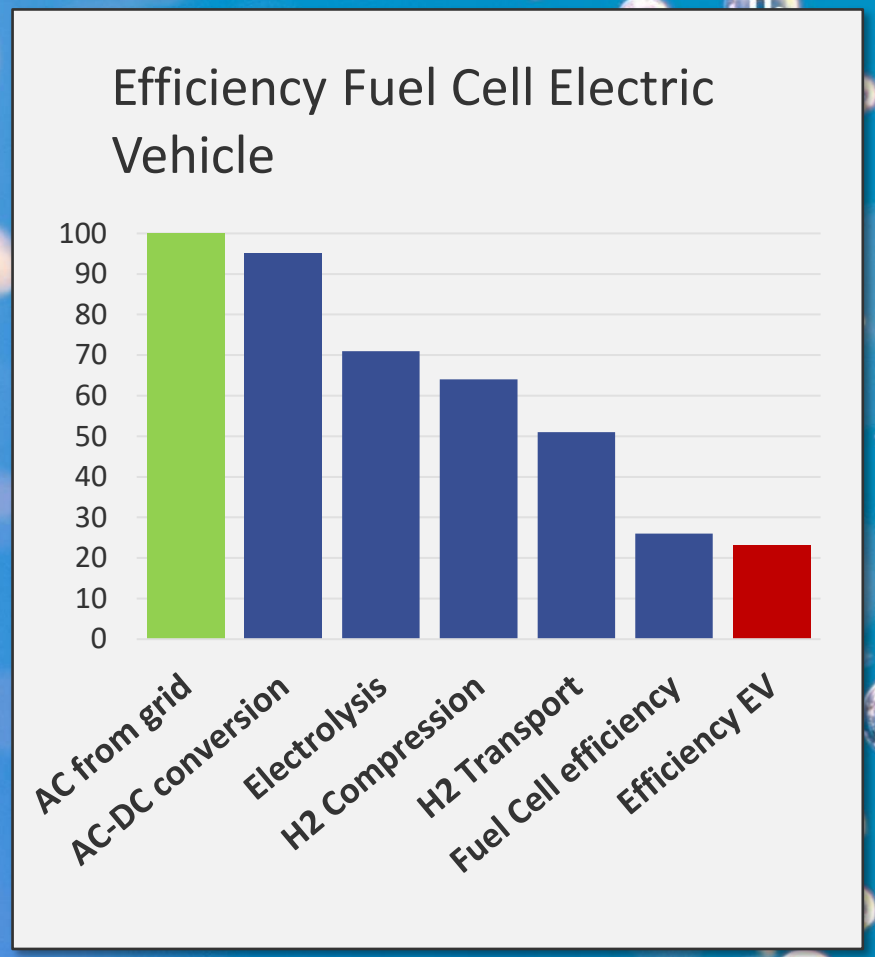
First fuel cell prototypes from Kenworth

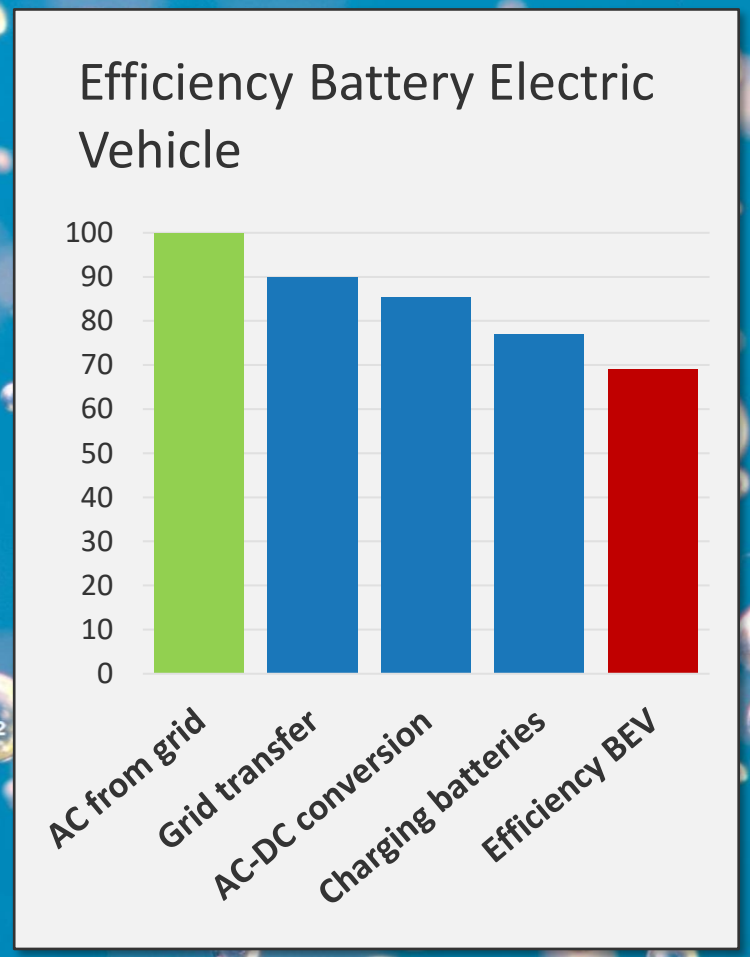
- Port of Los Angeles – 10 vehicles
- Experiences shared within PACCAR

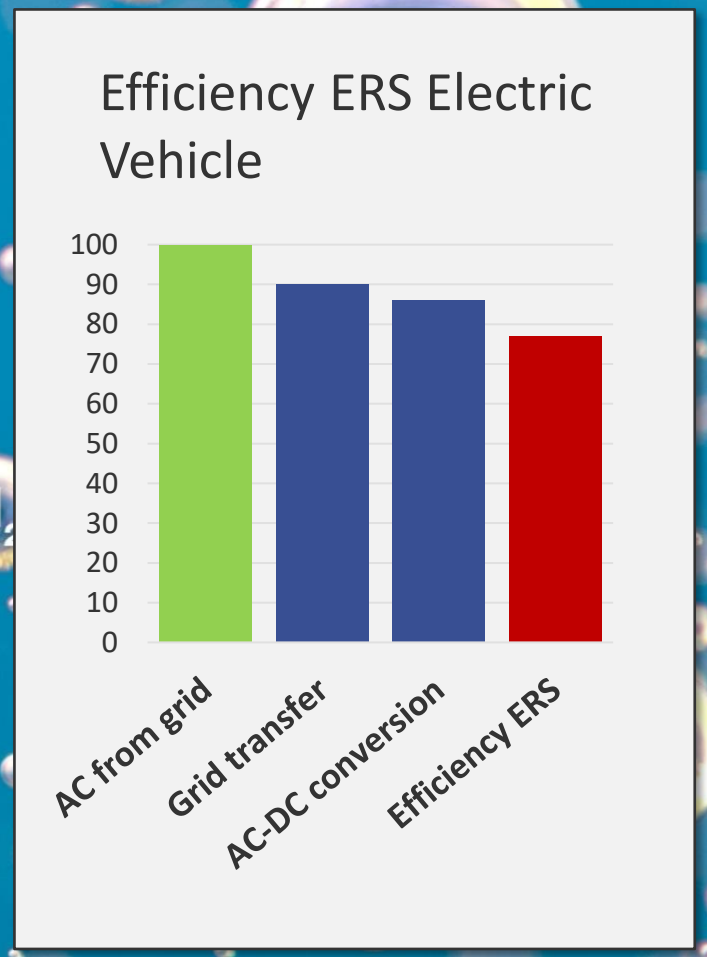
HYDROGEN PRODUCTION



ALTERNATIVES: **HYDROGEN**





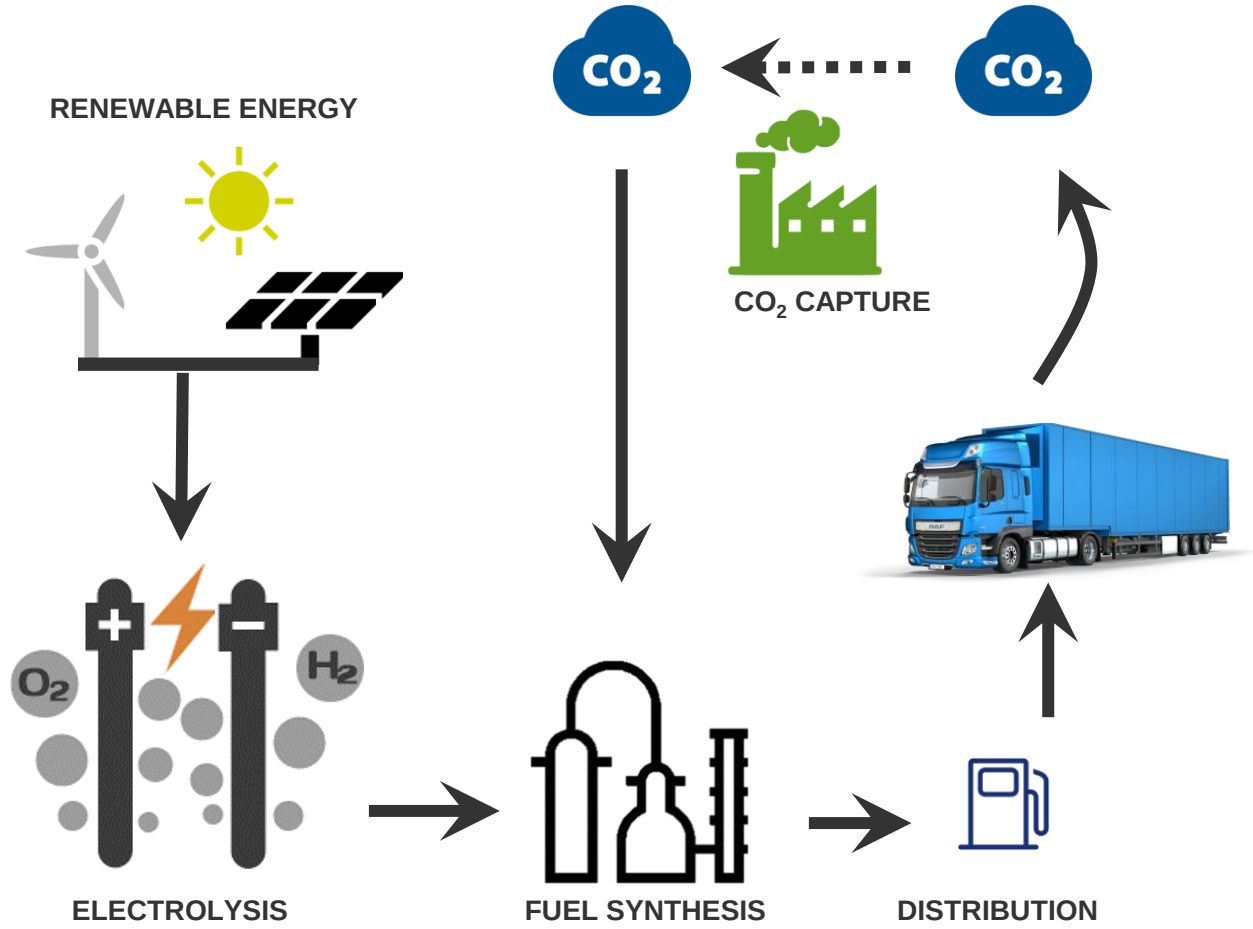


ALTERNATIVES: **POWER TO LIQUID**

- Completely CO_2 neutral
- Hydrogen from electricity generated with overshoot of solar, wind, water energy

- High Quality Standards
- Costs: Prices need to fall
- Available from 2025/2030

- Compatible with Euro 6 diesel engines
- Existing fuelling infrastructure
- Continue to use highly efficient diesel engine



Source : 2nd International Conference „FEV Zero CO2 Mobility“ in Aachen, Nov. 2018

PARAFFINIC ‘DROP IN’ FUELS
PRACTICAL ALTERNTIVES TO DIESEL

ALTERNATIVES: **HVO – RENEWABLE DIESEL**

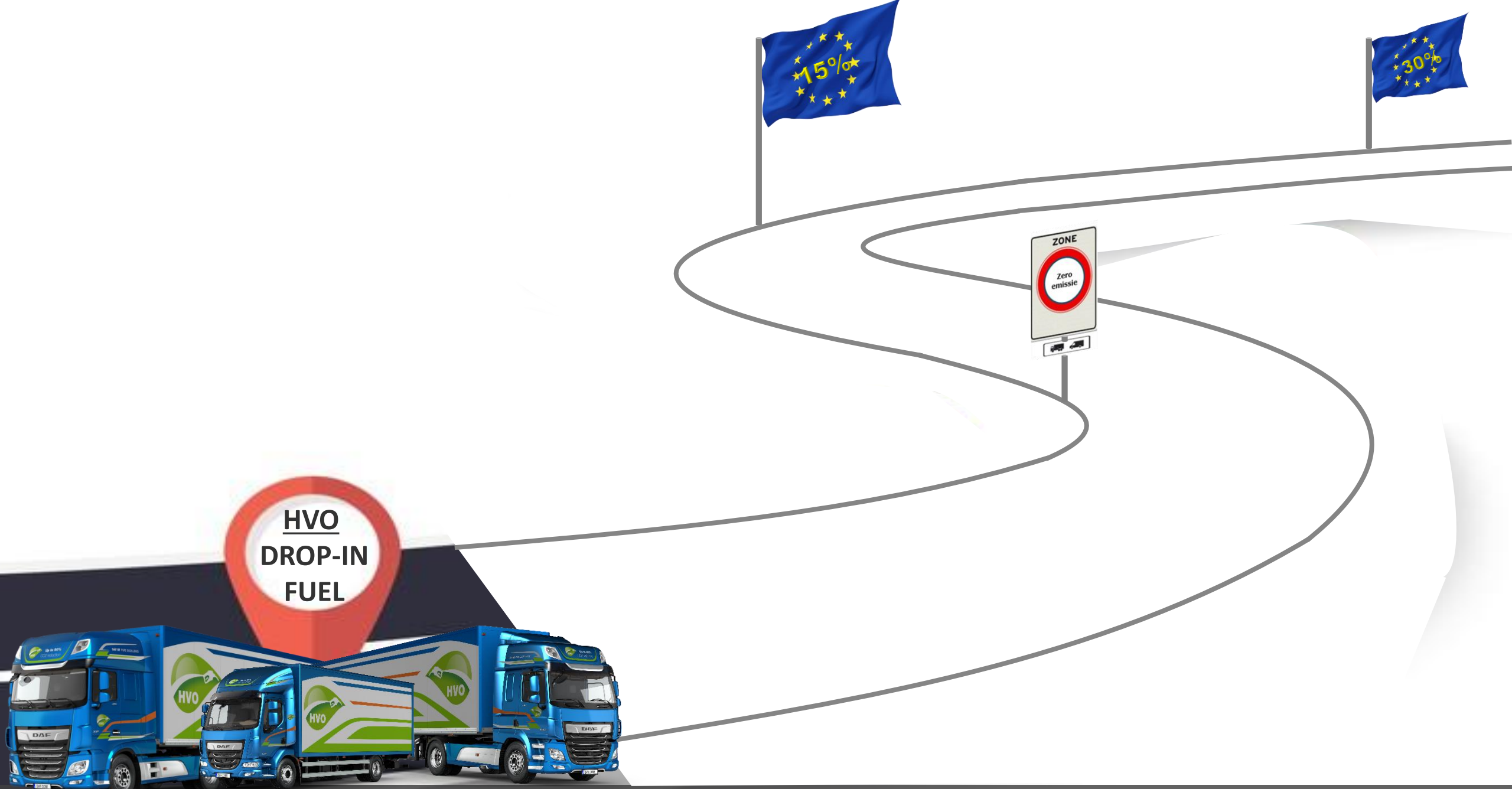
Hydro-treated **V**egetable **O**il

- Vegetable oil & waste fats – no competition with food production
- ‘Drop in fuel’ – suitable for diesel engines without modifications
- Biodegradable
- Lower NOx and Particulate Matter
- Defined standard: EN15940
- **Up to 90% well-to-wheel CO_2 reduction**

ALTERNATIVES: **HVO – RENEWABLE DIESEL**

- Air quality – almost no sulphur, aromatics or oxygen
- Easy to distribute – no special pipes or tanks
- Stability – no special storage requirements
- Temperature tolerance – as EN590
- 100% drop-in fuel – can be blended with EN590
- Odourless
- Growth in supply of HVO

- Lower density than EN590, lower energy per litre
- Small price premium


15%
30%
ZONE
Zero emissie
HVO
DROP-IN
FUEL
HVO
HVO
HVO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